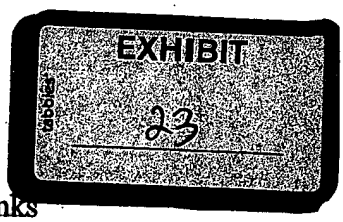

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Pyruvate improves redox status and decreases indicators of hepatic apoptosis during hemorrhagic shock in swine.

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Previous studies have shown that the liver is the first organ to display signs of injury during hemorrhagic shock. We examined the mechanism by which pyruvate can prevent liver damage during hemorrhagic shock in swine anesthetized with halothane. Thirty minutes after the induction of a 240-min controlled arterial hemorrhage targeted at 40 mmHg, hypertonic sodium pyruvate (0.5 g. kg(-1). h(-1)) was infused to achieve an arterial concentration of 5 mM. The volume and osmolality effects of pyruvate were matched with 10% saline (HTS) and 0.9% saline (NS). Although the peak hemorrhage volume increased significantly in both the pyruvate and HTS group, only the pyruvate treatment was effective in delaying cardiovascular decompensation. In addition, pyruvate effectively maintained the NADH/NAD redox state, as evidenced by increased microdialysate pyruvate levels and a significantly lower lactate-to-pyruvate ratio. Pyruvate also prevented the loss of intracellular antioxidants (GSH) and a reduction in the GSH-to-GSSG ratio. These beneficial effects on the redox environment decreased hepatic cellular death by apoptosis. Pyruvate significantly increased the ratio of Bcl-Xl (antiapoptotic molecule)/Bax (proapoptotic molecule), **prevented the release of cytochrome c from mitochondria, and decreased the fragmentation of caspase 3** and poly(ADP ribose) polymerase (DNA repair enzyme). These beneficial findings indicate that pyruvate infused 30 min after the onset of severe hemorrhagic shock is effective in maintaining the redox environment, preventing the loss of the key antioxidant GSH, and decreasing early apoptosis indicators.